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ABSTRACT

Many young children are being placed in a formal reading program before they are cognitively ready. Jean Piaget's developmental theory challenges educators to begin viewing learning and cognitive development from the child's point of view. Interpreters of Piaget's theory have addressed themselves to the teaching of math and science concepts, but little information is available for the use of the reading specialist. This presentation summarizes the logical thinking processes which are integral parts of "learning to read." In addition, simple assessment tasks for determining cognitive level, a curriculum model, and physical arrangements which would facilitate thinking processes are outlined. (Author/KS)

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READING COMPREHENSION:

PIAGETIAN ASSESSMENT AND INSTRUCTION

Paper Presented
at the Twenty-first Annual
International Reading Association

Anaheim, CA.

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ABSTRACT

Jean Piaget has challenged educators to begin viewing learning and cognitive development from the child's point of view.

Many interpreters of Piaget's theory have addressed themselves to the teaching and learning of math and science concepts from a Piagetian framework. However very little information is available for the use of the reading specialist and classroom teacher who would like to develop the teaching of reading effectively from a Piagetian viewpoint.

The author illuminates the logical thinking processes which are integral parts of "learning to read." In addition, a curriculum model and physical arrangements which would facilitate those thinking processes are discussed and summarized.

Today's changing world and the changing needs of mankind have resulted in new views of education, views based upon the need to solve problems, to be inventive, to discover and create new ways and modes of living. More emphasis is placed upon humanization and individualization. The student's self-concept is a significant factor in successful learning experiences.

In traditional American education, the child was seen as a passive recipient of knowledge with rote learning considered an efficient manner of gaining an education. In the 1960's educational libraries were filled with titles criticizing American teaching practices as inhumane and detrimental to intellectual development.[1] Charles Silberman and other compassionate critics of education began a revolution of looking at learning from the standpoint of child development rather than as an accumulation of curriculum facts.[2]

With child development as an important consideration, educators turned to research and to various theories and philosophies for help and guidance. Among the theories considered were the ideas of Jean Piaget, noted Swiss psychologist, and his views on the development of the young child. Educators were influenced by Piaget's concept of the child as an active learner, recreating knowledge from his own experience. Piaget has said,

> The principal goal of education is to create men who are capable of doing new things, not simply of repeating what other generations have done--men who are creative, inventive, and discoverers. The second goal of education is to form minds which can be critical, can verify, and not accept everything which they are offered. The great danger today is of slogans, collective opinions and ready-made trends of thought. We have to be able to resist individually, to criticize, to distinguish between what is proven

and what is not. So we need pupils who are active, who learn early to find out by themselves, partly by their own spontaneous activity and partly through material we set up for them; who learn early to tell what is verifiable and what is simply the first idea to come to them.[3]

This implies that education must be more than memorizing bits and pieces of information and learning separate skills in curriculum areas. Piaget indicates that schools need to focus on the development of children's knowledge in a broad sense.

Hans Furth, a noted interpreter of Professor Piaget's work, says that educators must understand the distinction between "knowledge" in the narrow sense and "knowledge" in the broad sense.[4] Having a child memorize that Washington is the capital of the United States is an example of knowledge in the narrow sense. Having the experience of seeing pictures of Washington, D.C., reading stories about historical government figures, visiting a capital city and/or talking to a senator who works in Washington, D.C., all give the child a general framework that enables him to understand that Washington is the capital of the United States. This is an example of knowledge in the broad sense. Knowledge in the broad sense is not a collection of specific facts learned by rote. Rather, it is an organized unit of experiences in a structure that is qualitatively different than mere statement of fact.

General knowledge is the referent point for understanding specific facts. Piaget was concerned with how cognitive development or comprehension develops in the young child rather than how the child acquires specific knowledge. Thus, a primary purpose of the reading teacher appears to be studying how children acquire comprehension in reading. Some teacher's manuals and reading tests are prone to stress recall of details

while giving little attention to higher level skills. Asking for facts assesses the first level of knowledge, knowledge in the narrow sense, according to Bloom's Taxonomy of Educational Objectives.[5] However, in formulating objectives for teaching reading comprehension, teachers should be concerned with knowledge at higher levels of understanding such as interpretation of facts, application of knowledge, analysis and synthesis of information and evaluation of statements from a personal perspective gained through experience.

Education and Development

Piaget built his studies around that fact that knowledge comes from within a child and not from without. His theory is based on the idea that learning is experiencing. In Piaget's own words:

> The goal of teaching is not to increase the amount of knowledge but to create the possibilities for a child to invent and discover. When we teach too fast, we keep the child from inventing and discovering himself. Teaching means creating situations where structures can be discovered; it doesn't mean transmitting structures which may be assimilated at nothing other than a verbal level.[6]

Speaking directly to educators, Piaget criticizes us as being more concerned with teaching than with learning. Our universities concentrate on teacher training methods and curriculum ideas rather than on child psychology and the nature of learning and developing. Teachers have a tendency to teach and have children listen.[7]

According to Piaget, we violate the principles of learning when we, as teachers, rely on telling the child and having the child listen and memorize information and facts. Piaget emphasizes that rather than memorize, children should have a rather large conceptual base acquired from

firsthand experience. Then, words have meaning for them. Interpreting this into classroom practice means, "experiencing" for all children. This is accomplished by the child's interaction with others and the environment, not by his sitting on chairs and parroting answers.

Piaget's Periods of Cognitive Development

Piaget has established four basic periods or stages through which cognitive abilities develop. These periods are based on specific qualitative changes in cognitive functioning. They are not presented as discrete stages, but rather as a sequence of cumulative developments, each new step in development becoming integrated with previous stages.

In a general way, the fact should be emphasized that the behavior patterns characteristic of the different stages do not succeed each other in a linear way (those of a given stage disappearing at the time when those of the following one takes form), but in a manner of the layers of a pyramid (upright, and upside down), the new behavior patterns simply being added to the old ones to complete, correct or combine with them.[8]

Piaget suggests normative age spans during which specific cognitive functioning becomes active. These spans are based on the approximate ages when behavior evident of cognitive functioning is observable. The actual age at which development takes place varies individually according to hereditary potential and experience.

Piaget does state that although ages may vary, sequence does not. Every individual passes through the stages of cognitive development in the same order. The stages, or periods of cognitive development, are broadly summarized as follows:

The period of sensori-motor intelligence (approximately 0-2 years)

The period of pre-operational thought (approximately 2-7 years)

The period of concrete operations (approximately 7-11 years)

The period of formal operations (beginning approximately 11-15 years) Piaget's theory of cognitive development thoroughly describes the development that takes place in the course of each period.

Characteristics of the Stages

In any number of books explaining Piaget's general theory of intellectual development, one can read more about the developmental milestones achieved in each stage of growth in cognition. Some of the best interpretations, in order of their difficulty, are Barry Wadsworth's Piaget's Theory of Cognitive Development, Herbert Ginsburg and Sylvia Opper's Piaget's Theory of Intellectual Development and John Flavell's The Developmental Psychology of Jean Piaget.[9] For the purpose of summarizing the major components of cognitive thinking in each stage the following outline is included.

(1) Characteristics of sensori-motor intelligence (approximately 0-2 years)

a. reflexive behavior gives way to sensori-motor responses and budding concepts of time, space and causality
b. object permanence occurs
c. beginning to look at things heard, grasp things seen, manipulate things felt
d. language not necessary for thought concepts
e. object invariance develops object concept
f. rudiments of causality are acquired by trial and error of random movements

(2) Characteristics of pre-operational intelligence (approximately 2-7 years)

a. concepts are dominated by perceptions

b. does not conserve

c. attends to only one property or experience at a time, categorizes objects on the basis of one characteristic (transductive reasoning)

d. multiple classifications are beyond the child's combinatory thought

e. progresses into development of language and the socialization of behavior

f. egocentrism (not seeing another's point of view). Child is unaware that he is egocentric and doesn't see the need to become different

g. social interaction acts to dissolve cognitive egocentrism

h. unable to follow transformations, doesn't follow action through its sequential stages. This inhibits logic in thought. The child is not aware of logical relationship

i. unable to decenter, tends to center on perceptual aspects of objects and disregards logical reasoning

j. unable to reverse operations, cannot follow a sequence back to the original, cannot maintain equivalence of quantity in the face of perceptual change

k. uses trial and error problem solving strategies

l. believes only literal translations, experiences difficulty in following double meanings of jokes, idiomatic phrases and metaphors

(3) Characteristics of intuitive operational intelligence (approximately 5-7 years)

a. less egocentric; beginning empathetic understandings

b. focuses on separate characteristics but disjointly

c. tied to concrete thinking (real objects and situations)

d. sees whole or parts but doesn't coordinate them

e. categorizes according to one criteria only

f. begins trial and error sequencing of four or more objects

g. reverses thought if illustrated with slow and obvious changes

h. follows a transformation forward only

i. cannot coordinate following the transformation and reversing thought

(4) Characteristics of concrete operational intelligence (approximately 7-11 years)

a. begins to decenter perceptual awareness, can "think" of two or more common characteristics of concrete objects (combinatory thought)

b. becomes less egocentric, emphathizes and mentally compares his ideas and feelings with others

c. begins transitivity, arranges objects in a "less than" or "more than" category. Seriation begins to become efficient and logical

d. class inclusion develops, whole and part can be thought about independently, multiple classification is possible

e. reversibility begins to develop. In the conservation concept, the child is able to follow the operation from its conclusion to its beginning and vice versa without changing the materials

f. develops casual relationships, the recognition that there are different ways of combining parts

g. capable of:

1. logical seriation
2. class inclusion
3. recognition of equivalence
4. exercising reversibility and
5. conservation

h. must have the reality of materials to mentally operate on relationships

(5) Characteristics of concrete transitional operation intelligence (approximately 9-11 years)

a. hypothesizes but does not exhaust all possibilities
b. recognizes identity verbally
c. follows reciprocity verbally
d. matches fine discriminations
e. classifies pictures according to paragraphs read
f. successfully completes double and reversed sequences of many graduated objects
g. hypothesizes about transformations

(6) Characteristics of formal operational intelligence (begins approximately 11-16 years into adulthood)

a. combines thoughts in rules or variables to solve problems
b. analysis is possible as well as synthesizing new solutions to problems
c. symbolizes plans of action prior to dealing with a problem
d. follows syllogisms involving a major premise, a minor premise and a conclusion
e. typically has new qualitative power to envision alternatives

to the way things are done (e.g., child-rearing, education, government)

f. the young formal operational thinker behaves somewhat like an egocentric adult and is critical of reality because he believes he can hypothetically cure societal ills (e.g., eradicate prejudice, abolish poverty, etc.)

Piaget views intelligence as a developmental process, based on the gradual construction and modification of cognitive structures, as a result of the functioning of assimilation and accommodation. Accordingly, the objective of Piaget's work has been to document the gradual development of these cognitive structures and the resulting cognitive abilities.

Piaget's general "hypothesis" is simply that cognitive development is a coherent process of successive qualitative changes of cognitive structures (schemata), each structure and its concommitant change deriving logically and inevitably from the preceding one. Successive schemata do not replace prior ones, they incorporate them, resulting in a qualitative change.[10]

Intellectual Development

A child does not move from one stage of development to the next by direct teaching and by increasing his factual knowledge. Neither does a child have all of his cognitive functioning stored inside his head waiting to unfold as he matures. Piaget emphasizes that it is a mediated interactive process of experience coupled with inherited capacities which lead toward progression of intellectual development from one stage to the next.[11] Piaget defines intellectual growth as a result of four factors. As illustrated in Figure 1, intelligence depends upon the interaction of physical maturation, experiences with "things" in the environment, social interaction and equilibration.

Insert Figure 1 about here

Learning

Learning activities may take place on a mental or physical level, or a combination of both, depending on the level of functioning of the children and the particular subject matter presented. The teacher's question which arises out of this is, "How do I tell at what level my children are functioning?"

In order to plan learning activities, the teacher must know what the child is capable of learning. To answer this, one can again refer to Piaget's basic theory of cognitive development. One of the basic postulates is that children develop through four general stages. These stages are based on various levels of mental functioning and result in particular observable behavior.

Piaget's research tasks can be adapted for classroom use to diagnose the level at which a child is functioning.[12] These assessments can be revised as activity "tasks" so that the teacher can observe how the child approaches the solution to each task.[13] By examining the child's characteristic behavior in comparison with the stages of cognitive development Piaget describes in his books, the teacher can acquire a good idea of the child's operational level, the child's level of cognitive functioning.

Once a child's general level of cognitive functioning is established, the teacher can determine the experiences that will encourage continual intellectual development and also determine the best method for presenting those experiences. For example, during the preoperational period, symbolic play is an important mode through which learning takes place. During the concrete operational period the child must be provided with objects and situations which can be manipulated physically and mentally in order to develop

the schemata (knowledge) for such operations as association, classification, seriation and conservation. The formal operational child is able to solve problems involving hypotheses and propositions. For each level of functioning, there are methods which best encourage development.

Piagetian "tasks" are a very desirable means of assessment as they provide situations, in which not only are the child's answers apparent, but the child's reasoning patterns are also clearly observable. The teacher questions the child about the procedure he is using for solving the tasks. This provides further opportunity to determine learning abilities and problems--much information is gathered.

Application of Piaget's Theory to Reading

The complex process of reading includes many types of thinking skills and abilities. Psychologists and educators have been studying this process for years but no one has yet discovered exactly how children learn to read and to read with comprehension. The skills of simple association as well as the complex analysis involved in critical thinking and problem solving have been isolated as related to reading and reading comprehension.[14]

Reading and Research

A following summary of the current research comparing reading achievement and cognitive thinking indicates that reading efficiently with comprehension is correlated with the concrete stage of cognitive operations. The assumption is that in order for a child to comprehend meaning from written English, he must have attained a higher level of cognitive development than association, recognition, recall and/or perceptual awareness (discrimination). A further assumption is that there are certain cognitive processes that a child must have acquired in order to successfully comprehend the reading process.

Millie Almy found a rather high correlation between the ability to conserve concrete substances and beginning reading achievement. She indicated that the abilities to reverse thought processes and decenter perceptions which underlie conservation, might be prerequisite to successful beginning reading instruction.[15]

Supported by numerous research studies on cognitive and perceptual development, David Elkind also stresses the importance of the attainment of concrete operations before a child is required to learn to read English in a formal reading scheme.[16]

Jeanette Gallager, from Temple University, has recently analyzed the results of the current research dealing with Piagetian theory and reading. Her conclusions indicate that a preoperational stage child, without the higher levels of classification, seriation and conservation thinking, is bound to have some failures and some gaps in reading comprehension.[17]

The Reading Failure of the Preoperational Thinking Child

The preoperational child is bound by certain inefficient cognitive abilities in relation to reading. The child who has not attained concrete stage thinking is hindered by egocentrism, by an inability to follow transformations, by centration and by irreversibility of thinking.[18] Each of these prelogical processes affect the child's ability to use the reasoning of logical classification, seriation and conservation or critical thinking and problem solving necessary in reading.

If a teacher finds that a child is having great difficulty applying rules of decoding, and if a teacher finds that a child lacks comprehension in reading analyses, one of the following cognitive processes may give insight into the problems of reading failure.

Egocentrism. The actions and thoughts of the preoperational child are

internalized via symbolic functions; but thought is not liberated from the child's perceptions. Through egocentric thinking the child believes that all people think as he does; the child can't get out of himself and take the viewpoint of another. As the child is exposed to more social interaction and finds other children's perceptions conflicting with his, the child begins to have to accommodate to other persons egocentric thoughts. The young school age child of five, six or seven will begin to seek verification of his thought as he must consider other's viewpoints through peer pressure and other social contacts. As empathy begins to develop, egocentrism begins to dwindle. If a child is dominated by egocentrism, that is with thoughts centered around himself, the comprehension of stories must be based on a child's experience or fantasies in order for him to be interested in the content.

Centration. The preoperational child has a tendency to "center" his attention on only one part of a whole at a time. Piaget used an interesting task to demonstrate the young child's inability to perceive more than one aspect of a situation at a time. For example, if we show a young child two rows of pennies (Figure 2) and then move the pennies so that one row appears longer (Figure 3), the child will not focus on the distance between the pennies or the spatial relationship. When asked which row is longer the child will focus on the length of each row of pennies and say, "Now, the bottom row has more pennies" (in Figure 3).

Insert Figures 2 and 3 about here

The child persists in this response even though the rows of pennies were equal in length and number when the experiment began.

Some teachers are unaware of this centering characteristic of young

children. Without this understanding of a young child's perceptual development, teachers ask primary age children to take words apart by sounding them out. They also ask children to put words together in spelling by the use of grammatical spelling rules. These tasks with abstract symbols require the child to decenter his perceptions. It is only through decentering that he can string words together by sounding them out at the same time he is using grammatical rules of grapheme/phoneme relationships. If a child does not have the cognitive operation of decentration in the task with the pennies, he will not be able to use that same cognitive skill in learning to read the English alphabet.[19]

Parts and Wholes. The centering child will be able to recognize sight words and memorize the sounds of separate letters. However, he will not be able to "see" that a whole word can be broken into separate letters which have meaning in isolation as well as blending into whole words. The ability to "see" this is related to a child's ability to deal with parts and wholes simultaneously. Decoding becomes a confusing system. Magic seems to take over at times. Much guessing and failure results for the pre-logical child.

The child who is in the preoperational stage cannot be expected to learn abstract rules and apply them. Although he can memorize rules, he is usually unable to keep the rule in mind while he constructs an application of that rule. He cannot "center" on two thought processes at once. Thus children from two to seven should not be expected to pursue a reading program based on naming the grapheme/phoneme relationship at the same time they are putting letters together to form words and words together to form meaningful sentences. Teachers can teach children to memorize the verbal relationships in alphabets such as ITA or DISTAR[20] even without

understanding. This does not mean children will be able to differentiate situations in which the rules apply and those that do not apply.

Insert Figure 4 about here

The small child may know the individual letters c, a, and t from an array of alphabet letters (see Figure 4). But, letters which are transformed by their surrounding, CAT (the letters c, a, t combined), denote a different graphemic-phonemic relationship. For example, the separate sounds c/a/t/ do not sound like cat, even if you "say it fast" as in the DISTAR method.

The preoperational child, who is not able to analyze words as they change their configuration, would have difficulty "sounding out" the phonetic equivalent of "a" in the following words (see Figure 5).

Insert Figure 5 about here

This same preoperational child would have even greater difficulty deciphering the "a" sound in the second group of words (see Figure 6).

Insert figure 6 about here

At his level of development, the preoperational child cannot memorize a rule and then decide which words follow the rule and which words do not follow the rule. To the child, letters and sounds should have a one-to-one relationship, one sound for one letter. Rules and applications as well as exceptions are beyond his stage of thinking.

If children are placed in a formal reading program and required to decode words, they lose track of the meaning of the words while they are decoding. Reading becomes, for them, only a saying of words, not processing for understanding. In practicality, children taught solely by memorizing

the sound-symbol relationship appear to have difficulty in comprehension. Is there any doubt that these children would often have low comprehension scores on reading tests?

Irreversibility. Reversibility of thought processes allows the child to perform the mental activity of following an operation from its conclusion back to its beginning and vice versa. The inference might be drawn that a preoperational child, who cannot reverse his thought processes, should not be expected to succeed in converting graphemes to phonemes by memorizing the sound that goes with the symbol when he is reading, and then validate his "knowing" by attaching the right grapheme to the phoneme when he is writing. Those processes take reversibility in thinking, they are reversed operations.

In reading, a child may be presented with both upper case letters and lower case letters, different type faces, manuscript and cursive writing and variations in assigning phonemes to particular letters. Under these conditions the preoperational child whose thinking is irreversible may experience failure in beginning to read. Analyzing this evidence indicates that it takes concrete stage thinking[21] to be able to deal with parts and wholes of words and to think about all the possibilities the letters of the alphabet might denote. Thus, in order to deal with the transformed letters and hold rules of relationship in mind while synthesizing meaning, a child must be able to reverse his thinking, be a concrete stage thinker.

Inability to Follow Transformations. The preoperational child cannot attend to transformations from one state to another. For example, if a pencil lying on a table fell to the floor, the preoperational child will look for it on the floor. He can anticipate cause-effect relationships but he can't think about all the steps between (e.g., he can't visualize the

pencil in flight from table top to the floor).

Since higher levels of cognitive functioning than simple associations are thought to be essential to effective reading comprehension, instructional activities must be analyzed for the thinking processes required for successful completion.

Levels of Representation

Symbolic representation is a central core of cognitive development in Piaget's theory. It is the "stuff" of much mental activity. In like manner, symbolic understanding is the basis of the reading process and of reading comprehension. Although a child in the sensorimotor state begins to have crude mental images of reality, the preoperational stage (approximately 2-7 years of age) is the time a child begins to think and solve problems by means of mental representations.

But how does a child begin to comprehend reality by means of the abstract English alphabet? Recently, Molly Gorlich from California State at Northridge has developed a classification of the progression children's thinking goes through from concrete reality or experience to abstract symbols.[22] It is based upon the simple proposition that knowledge or the acquisition of abstract concepts (which reading seems to be) is the problem of finding the relationship between the subject (the child) and the object (the real thing).

If a teacher wants a child to read the word "apple," there are various ways she can teach him that word. The teacher can present the word over and over and have the child verbalize the word as he sees "apple." There is no question that a child can learn this association by repetition or memorization. However, from Piaget's definition of knowledge, the above mentioned technique would be knowledge in the narrow sense. As interpreted

from Piaget's definition of knowledge in the broad sense, he would more likely view reading as acquiring meaning from various levels of representation of the object or of reality. (See Figure 7.)

Insert Figure 7 about here

Dr. Gorelich's classification would begin by having the child experience the real apple. In order for understanding to take place, a child may need other levels of experience in addition to sensing the real apple; he needs to see a picture of an apple as well as a dramatic impression or modeling an apple. Through these added experiences the abstract level (e.g., word symbol "apple"), begins to have meaning as he hears the word or reads the word.

The preoperational child, from approximately two to seven years of age, should have the opportunity to build both a perceptual and a meaning base from his environment. The environment should emphasize interaction with concrete materials and experiences, as well as pictorial and symbolic representations of reality. Exploration and manipulation are the key modes of experiencing. Reading and books should be a part of the general environment. The beginning reading program should grow out of a progression through perceptual-motor functioning (sensing) as well as experiences with pictorial and abstract representations.

Approaches to Reading Instruction

The instructional approach which most closely approximates this progression from concrete to abstract representation is the Language Experience Approach to reading.[23] (See Figure 8.) It is a living and learning environment based on developmental stages. The major premise is:

Insert Figure 8 about here

The Language Experience Approach to the teaching of beginning reading is based upon the belief that learning must be rooted in the experience of the learner in order for it to be effective. Learning to write and read, then, becomes an extension of a child's own language and experience which he already possesses. This is the conceptual base which is crucial to comprehension of words. All the thoughts and words which he can express become the material for his reading and writing program. Learning may come about without pressure or stress. The related language arts of spelling, penmanship, speaking, listening, reading and writing are taught together in this plan. This helps the child see the relationship among these skills.

Gradually, through exposure to a very large variety of experiences over an extended period of time, the abstract symbols of letters and words that stand for experiences take on meaning for the child. Then the child may be placed in a formal reading program where he progresses into reading books. Ideally a self-selected, individualized, or personalized reading program allows the child a pressure-free environment in which to learn and grow.

If, as Piaget postulates, the child is intrinsically motivated by the ability to do and to achieve, then he will be motivated by his success and pleasure in reading and read more and more.

Some General Implications for Education

Jean Piaget did not intend to answer the many questions which continually plague the field of education. His object, as a genetic epistomologist, was to determine the nature of intelligence and the process of its development. Although his resulting theory does not address itself directly to education, there are some implications for those who are concerned with teaching and learning.

In a Piagetian perspective learning can be described as the process of assimilation (integration of new knowledge into old framework), and accommodation (development of new concepts or modification of old concepts). Information received through experience with the environment is internalized into schema (knowledge in the broad sense).[24] This internalization results in adaptation to the environment. (See Figure 9.)

Insert Figure 9 about here

Piaget states that this internalization takes place as a natural consequence of interaction with the environment and other people. It is the child's action on his environment which increases his logical thinking. This action results in the assimilation of new information and the accommodation or changing of existing schemata or knowledge. In Piagetian terms, learning and intelligence are defined as successful adaptation to the environment.

The type of learning that takes place depends heavily on environmental conditions. Although each individual is hereditarily endowed with a potential for learning and intrinsically motivated toward mental functioning, the environment determines if his potential will be realized. The environment provides the situations in which interaction and subsequent mental activity can take place.

In planning for learning, teachers should provide an environment in which a child can actively inquire, explore and manipulate problems and materials to be learned. The processes of assimilation and accommodation will naturally allow the child to come to an organized and personal understanding of the material presented. His interactions with others, both children and teacher, will clarify his understanding. In this way the

teacher is a facilitator of the learning environment. The teacher clarifies, expands and asks questions.

Although the Piagetian tasks can be used for assessment of a child's level of cognitive functioning and thus, readiness for a formal reading program, the teacher should not use the tasks to teach classification, seriation, and conservation. The activities which are planned should be analyzed for the processes required to solve an educational game, complete a learning activity, or develop a project or unit.

Footnotes

1. For a summary of the critics' views, see William Van Til, ed., Curriculum: Quest for Relevance (Boston: Houghton Mifflin Company, 1971).

2. Charles Silberman, Crisis in the Classroom (New York: Random House, 1970).

3. Eleanor Duckworth, "Piaget Rediscovered," Journal of Research in Science Teaching, Vol. 2 (1964), p. 175.

4. Hans G. Furth, Piaget and Knowledge (New Jersey: Prentice-Hall, 1969).

5. Benjamin S. Bloom, ed., Taxonomy of Educational Objectives (New York: David McKay Co., 1956).

6. See Footnote 3.

7. Jean Piaget and Barbel Inhelder, The Psychology of the Child (New York: Basic Books, Inc., 1969).

8. Jean Piaget, The Origins of Intelligence in Children (New York: International Universities Press, 1952).

9. It is suggested that the novice in Piagetian theory begin with the concise and easily read book by Barry Wadsworth, Piaget's Theory of Cognitive Development (New York: David McKay Company, 1971). Two more difficult books for the person who has some knowledge of the basic theory, but wants more depth, are Herbert Ginsburg and Sylvia Opper, Piaget's Theory of Intellectual Development (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969) and John H. Flavell, The Developmental Psychology of Jean Piaget (New York: D. VanNostrand Company, 1963).

10. Wadsworth, p. 25.

11. Ginsburg and Opper, p. 70.

12. A resource unit developed for assessment and instruction in the

teaching of reading has been developed by San Mateo County Office of Education, 333 Main St., Redwood City, Calif., entitled Piaget-based Instructional and Assessment Games and Activities for Early Childhood.

13. Evelyn Sharp, Thinking Is Child's Play (New York: Avon Books, 1969), p. 53.

14. Joe L. Frost, Issues and Innovations in the Teaching of Reading (Atlanta: Scott, Foresman and Company, 1967), p. 57.

15. Millie Almy, Young Children's Thinking (New York: Teachers College Press, 1966), pp. 139-140.

16. David Elkind, Children and Adolescents, 2nd ed. (New York: Oxford University Press, 1974), pp. 174-176.

17. Jeanette Gallager and D. Kim Reid, "To Relate or to Discriminate--That Is the Question" (Paper presented at the Fifth Annual Symposium of the Jean Piaget Society, Temple University, June 1975).

18. Vicki Arnolt DeMao, "A Piagetian Interpretation of Reading in Early Childhood," in Gerald I. Lubin et al. (eds.) Proceedings of the Fifth Interdisciplinary Seminar on Piagetian Theory and Its Implications for the Helping Professions (Los Angeles: University of Southern California Bookstore, March, 1976).

19. Some languages are much easier to learn to read because there are fewer exceptions to grammatical rules and a greater correspondence of meaning for one letter or word.

20. Both ITA (Initial Teaching Alphabet) and DISTAR (Direct Instruction System for Teaching Arithmetic and Reading) are reading approaches which use unique alphabet symbols for phonic correspondence.

21. Refer to the concrete stage of development and its characteristics in a previous section.

22. Molly C. Gorlick, "A Classification of Concept Representations," in Gerald I. Lubin et al. (eds.) Piagetian Theory and the Helping Professions (Los Angeles: University of Southern California, 1974).

23. Roach Van Allen and Claryce Allen, Language Experiences in Reading (Chicago: Encyclopedia Britannica Educational Corporation, 1967).

24. Piaget uses the term "schema" or "schemata" to explain conceptual development as illustrated in Figure 8.

FIGURE 1

Intellectual Development

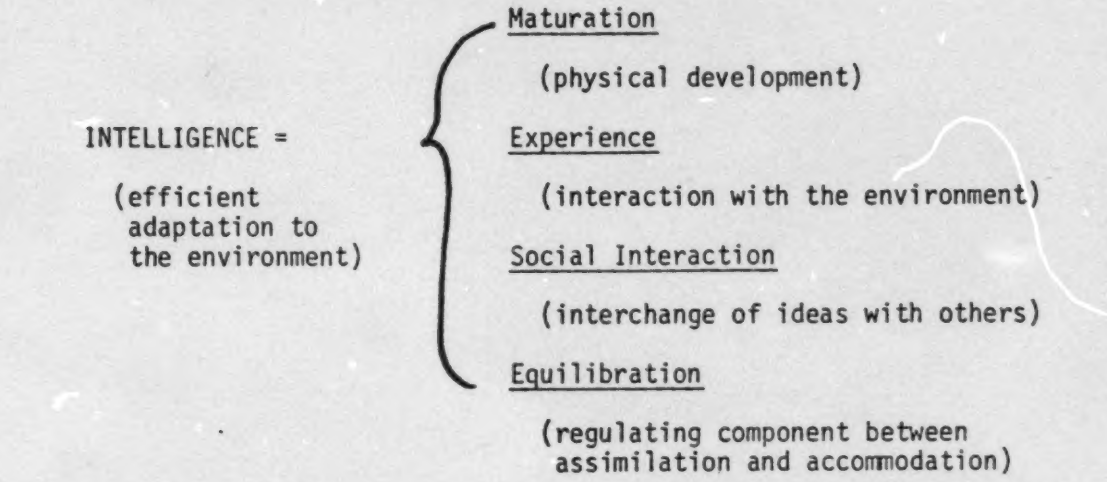

FIGURE 2

FIGURE 3

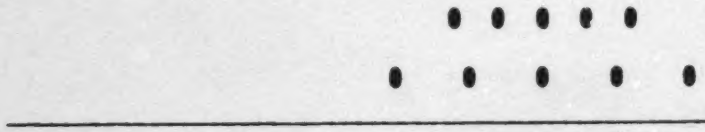

FIGURE 4

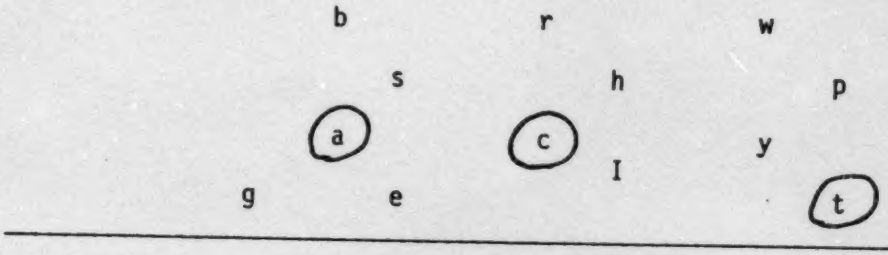

FIGURE 5

mat

mate

mark

FIGURE 6

great

grate

eight

FIGURE 7

1.0 CONCRETE LEVEL - three dimensional representations ranging from the real object or person, a general configuration of the object or person, or a general configuration of the object or person such as a plastic or wax model.

2.00 PICTORIAL LEVEL - two dimensional complete drawings or photographic reproductions of varying sizes and color to represent the concept.

3.00 SYMBOLIC LEVEL - two dimensional single line drawings, gestures or impressions.

4.0 ABSTRACT LEVEL - a representation that bears no relation in size, shape or form to the real object or person. For example: the written word "apple" or the spoken word "apple" or the finger spelled word "apple."

FIGURE 8

WHAT I CAN THINK ABOUT, I CAN TALK ABOUT

WHAT I CAN SAY, I CAN WRITE

WHAT I CAN WRITE, I CAN READ

I CAN READ WHAT I WRITE AND WHAT OTHER PEOPLE WRITE FOR ME TO READ

FIGURE 9

Adaptation to the Environment